HP NetServer LH 3000r
Rack Cabling Reference Guide

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1 Preparation for Cabling the NetServer LH 3000r

About Cabling the LH 3000r

NOTE	A checklist for the cabling process is included in Appendix A.

Before You Use this *Reference Guide*

This *HP NetServer LH 3000r Cabling Reference Guide* assumes that you have the rack assembly process completed, have mounted the HP NetServer LH 3000r, and are ready to cable the components in the rack enclosure.

If you want a high-level checklist to use in this process, see Appendix A.

For instructions on how to install the HP NetServer LH 3000r in a rack, consult the Installation Road Map shipped with your rack or the Installation Guide shipped with your NetServer unit.

NOTE	For instructions on how to assemble other components in a rack, please find and follow the documentation shipped with your rack components. If there is no such documentation with your rack and components, check the separately orderable installation kit. Or, use the generic rack assembly process described in this chapter.

The HP NetServer LH 3000r

This cabling reference is for the rack optimized HP NetServer LH 3000r shown in Figure 1-1.

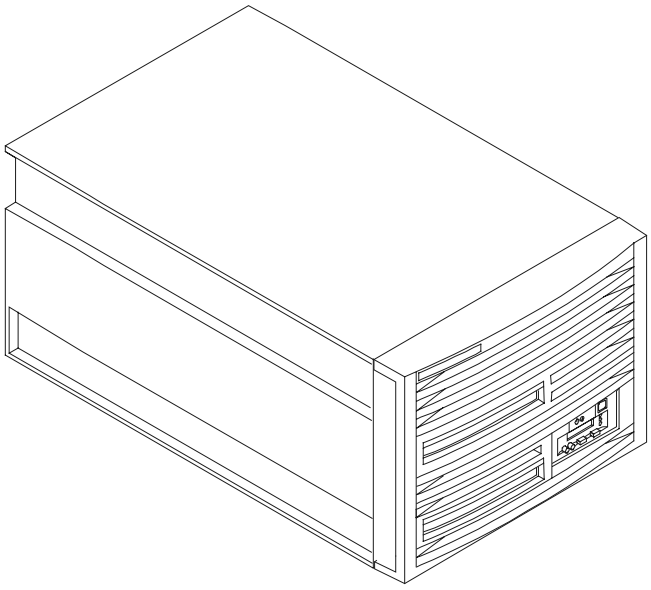

Figure 1-1. The HP NetServer LH 3000r

Site Preparation

You may want to copy and use the site preparation checklist in this section (Table 1-1). Doing so before you begin to install and cable the NetServer may reveal actions you can take to support your success. Also be sure to read the section on site preparation of circuit breakers.

Site Preparation Checklist

Table 1-1. Site Preparation Checklist

HP NetServer General Guidelines

	Logical and physical network design provided
	Server configuration parameters determined
	Disk partition and directory structure determined
	Required incoming power and data cabling in place
	Working LAN, one working client, one working printer available (if integrating into an existing network)
	Software license requirements met
	Networking peripherals connected

Floor

	Ensure the floor where the NetServer rack is to be installed is level
	Assess floor strength and ensure it is sufficient to support the type of rack you have ordered. (See the rack documentation included with your rack.)
	Ensure sufficient area to accommodate your rack, including up to 24 inches (600 mm) rear door clearance and 36 inches (900 mm) front door clearance.

Power

	Correct size, type, and rating of receptacles, circuits, and circuit breakers; see the section entitled “Site Preparation: Circuit Breakers.”
	Locate close enough to power sources so that power cords will reach
	If raised floor, need floor tile(s) with a cutout for cables, all posts electrically grounded
	Facility for grounding each rack to earth connection to ensure earth ground continuity for circuits to be used for rack mounted equipment

Table 1-1. Site Preparation Checklist (Continued)

Environment and Space Requirements

	Must meet OSHA, local code, and HP specifications for safety and supportability (3 feet minimum access in front and rear of electrical cabinets)
	Side access of 24 inches improves cable routing and management
	Optimal: 24 hour air conditioning (68 - 72 deg. F; 20 - 22 deg. C, 40 - 60% RH) Minimum: Maintain temperature inside NetServer enclosure between 41 and 95 deg. F, 5 - 35 deg. C
	Enough table or work space for console terminal and user guides
	Bookshelf for documentation
	Area to store equipment until time of installation
	Ensure all equipment and/or shipping pallets can fit through doorways, hallways, and into and out of elevators

Data & Voice Communications (Pre-Tested and Verified)

	Voice phone located at system console terminal with cord long enough to reach all parts of the rack installation
	Phone line for remote support at each system
	Ethernet, FDDI, Token Ring, or other network connection standard

System Parameters

	Hostname
	IP address
	Subnet Mask
	Gateway IP Address
	Gateway Host Name
	DTC Node Name

Hardware Configuration, Cables, and Additions

	Availability of I/O paths and SCSI addresses for add-on devices
	Availability of I/O backplane slots, memory slots, etc.
	Valid, supportable configuration for added devices, interfaces, memory, etc.
	Correct type and length of cables, as specified in order documents

Site Preparation -- Circuit Breakers

When you connect the HP NetServer LH 3000r to an AC power source, the server temporarily draws a large “inrush current.” This occurs even when the system is in

standby mode. Inrush current is much greater than the server's normal operating needs. Generally, your external AC power source can handle the inrush current.

However, if you install several HP NetServers on one circuit, precautions are necessary. For instance, if there is a power failure and power is then restored all the servers immediately begin to draw inrush current at the same time. If the circuit breakers on the incoming power line have insufficient capability, they may trip and thus prevent the servers from powering up.

When preparing your site for installation, allow for the additional inrush current. Consider the following before installing the server in your environment:

- In North America, a 20-amp-minimum circuit is to be used with one NEMA AB1 class 14B breaker for each 16-amp Power Distribution Unit that is to be connected to an HP NetServer LH 3000r.
- In Europe:
  - ◊ For a single LH 3000r unit in a rack, use a 16-amp-minimum circuit with one IEC MCB C-type breaker for each 16-amp Power Distribution Unit.
  - ◊ For multiple LH 3000r units in a rack, use a 16-amp-minimum circuit with one IEC MCB D-type breaker for each 16-amp Power Distribution Unit.

NOTE	Some local codes do not allow a 16-amp device to be connected to a 16-amp service. Consult a qualified electrician or local regulatory authority before beginning electrical site preparation.

Rack Assembly and Cabling Cautions and Warnings

Unterminated Power Cords Require Licensed Electrician

In some cases in the 230/240V environment, the Uninterruptible Power Supply (UPS) is shipped with a power cord that is unterminated. The reason is that the current demand of a fully loaded rack may exceed the demand for the normal circuit in some countries. Therefore, HP recommends that you have a qualified electrician or electrical engineer analyze the current demand for each branch circuit used by rack mounted equipment. Proper wiring and cord termination are part of the same process.

Prevent Electrical Shock

WARNING	Ensure site electrical circuits have reliable earth grounding. Never operate products in any rack enclosure with the ground connector disconnected. Although leakage current from any one device may be minimal, cumulative leakage current of equipment mounted in a rack may exceed 5mA, and could reach 15mA. This level of current can be dangerous, unless a reliable earth ground is in place. **Thus, reliable ground circuit continuity is vital to safe operation of this system.**

WARNING	Prevent shock hazard by disconnecting power and telephone cords when you service or install components.

Prevent Damage to Components

CAUTION	Rack optimized products are sensitive to static electricity (ESD). When installing components, take precautions against ESD damage. Wear a wrist-strap and use a static-dissipating work surface connected to the server chassis when handling printed circuit boards, memory devices, and processor chips or modules. Ensure that the metal of the wrist-strap contacts your skin and that the alligator clip is attached to a static-neutral surface.

CAUTION	Power up the components one at a time. Turning on an entire rack at one time may create damaging and dangerous electrical surges that could trip circuit breakers in the system. Follow instructions in the section entitled “Power Up Sequence” at the end of Chapter 3 to minimize current inrush.

Generic Rack Assembly Steps

Suggested Method for Building an HP NetServer Rack Installation

1. Check Site Preparation

Use the Site Preparation Checklist in this chapter to be sure that all necessary preparations have been completed, including:

- floor assessed for levelness and sufficient strength and space
- network and software guidelines met
- site electrical power supply set-up complete
- environmental and space requirements met
- data and voice communications pre-tested
- system parameters correctly configured
- hardware and cables order checked

2. Receiving

CAUTION	Units are heavy, often weighing between 85 and 180 lb. (50 and 110 kg). Do not attempt to move or install such units without help. Also, remove power supplies and hard disk drives to minimize the amount of weight to be lifted.

Compare the order documents to the packing list or to a list of boxes received. Check to see that all parts are present. Unpack the HP NetServer and external storage and tape backup units (if any were ordered).

NOTE	Save the boxes and packaging materials if you intend to reship the units and rack.

3. Prepare Rack Enclosures for Assembly

WARNING	A tip-over hazard exists. Rack enclosures are shipped upright and are top-heavy. Never move enclosures without adequate equipment and assistance. Use caution to prevent rack from falling over and causing potential damage or injury.

If you receive pre-configured units, follow assembly instructions from the supplying organization first, if you have them. Otherwise, continue with this set of instructions.

4. Move Rack Enclosures and Other Units to Installation Location

WARNING	Whenever you lift equipment, limit the amount of weight each person picks up. Lift with your legs, not with your back.

Use two or more people and the proper equipment to move the rack enclosure, server, mass storage units, and other components. Stage cartons a few feet from your assembly and final power-up location.

5. Unpack Rack Enclosures and Hardware, Use Anti-Tip Measures, and Remove the Shipping Panels

WARNING	Use care in moving the rack down from the pallet. Three people are required for this step.

1. Follow any pictorial instructions on the outside of the shipping container to unbox the rack enclosure.
2. Adjust the leveler screws, when present, under each of the four corners of each rack. Lower each leveler screw to be in firm contact with the floor.

CAUTION	The leveler screws prevent the rack from rolling away when you install components. Be sure to lower these screws before you put anything into the rack.

3. Find and extend the anti-tip foot under the rack (or bolt on the anti-tip mechanism, if included) before you mount any rack equipment on slides.

WARNING	When equipment is mounted on slides, a tip-over hazard exists. Always take the precautions listed below: • Extend or bolt on the anti-tip foot for each rack before mounting equipment on slides. • Never extend more than one piece of slide-mounted equipment at a time. • Reduce weight by removing power supplies. • Always use the rack mounting handles that are shipped on rack optimized units as shown in accompanying instructions.

4. Remove shipping panels, if present, from inside the rack enclosure. Save panels, screws, and rack nuts if you are going to reship the rack.

6. Unpack Remaining Components

Unpack each component in the order in which you assemble them (from the bottom of the rack upward). Each package contains rack installation instructions or a user guide.

NOTE	If an Uninterruptible Power Supply (UPS) is included, plug it in as soon as you unbox it. Doing so helps ensure batteries are charged when rack installation is completed.

7. Build Basic Rack Assembly

Position, Tie Together, and Open Up the Rack

1. Determine how rack bays are to be positioned. If two or more racks are to be tied together, use the optional tie-together kit. Otherwise, skip this step.

   Newer models may be tied together before or after equipment is mounted in them. Follow instructions included with tie-together hardware.

NOTE Older racks (with the words "HP Systems" on the nameplate) may require that enclosures to be tied together **before** any components are mounted inside them. To avoid problems, if older rack versions are to be tied together, do so before installing slide members, rails, shelves, units, or other hardware. Otherwise, you may have to remove components from the rack to gain access to the tie-bolt locations.

2. If present, remove the front and rear doors to increase accessibility inside the rack. Follow instructions shipped with the rack to do so.

NOTE Older racks (with the words "HP Systems" on the nameplate) may also require door hardware to be in place before mounting components. If you are using front or rear doors on older models of the HP Systems Rack, be sure the hinge and latch hardware is mounted before putting on any other hardware. This prevents later disassembly.

WARNING When the back door of a rack is removed, the hinge and latch catch brackets protrude. To avoid injury, temporarily remove these brackets prior to installing components into the rear of the rack.

3. If present, remove side panels to allow better access. Follow instructions included with the rack to do so.

8. Install Fans If Required and Redundant Switch and UPS First If You Have Them

1. If an extractor fan unit is to be used, install it following instructions which accompany the unit.

NOTE Most HP NetServers have an internal fan system. However, rack doors must be perforated (front and rear). In this case, you do not need an extractor fan.

2. If an Uninterruptible Power Supply (UPS) is used, install the UPS mounting rails and fasten the unit in place following instructions which accompany it. Place the UPS equipment in the lowest EIA Units of the rack. Plug the UPS in to charge the batteries as soon as possible.

3. Install the Redundant Switch, if you have one, in one of the configurations shown in Appendix B.

9. Mount Component in the Rack

Plan Component Locations

Use the original ordering information to locate where each component goes in the rack.

If the original ordering information is not available, use HP rack configuration tools to plan the location of each component.

HP NetServer rack configuration tools (for instance, HP Rack Assistant) make ordering easier and automatically check that orders are complete. These tools can be found on the HP web site. Use the Search function with the words "rack configuration tools" at the following URL:

`http://www.hp.com/go/netserver`

Look for "Ordering NetServers," "Select a Configuration," "Configuration Software," or "Rack Assistant."

Mount Each Unit in the Rack Enclosure

1. Position each unit following the original layout used to order the server. Follow the instructions which accompany each component. If you do not have the original layout, you can use HP rack configuration tools, available at HP's web site, to regenerate it.
2. Rack-optimized HP NetServers and mass storage units have instructions in their user or installation guides for mounting the units in the rack enclosure. For other servers and storage units, rack mounting instructions are included with optional rack-mount kits, if available. See the user or installation guide or rack-mount kit instruction sheet which accompanies your unit for details.

CAUTION	To prevent rack tip-over, extend or bolt on the anti-tip foot before installing units on sliding members. Also prevent rack tip-over by extending only one piece of equipment at a time from the front or rear of the rack.

3. You may already have installed the UPS, Redundant Switch, and Power Distribution Units. Do so now if you have not. Begin at the bottom of the rack, installing the rack mount kit for the first component just above the power components. Configuration information and examples are available in Chapter 2 and 3.

NOTE	For both safety and accessibility, always start assembly at the bottom of the rack and work upward.

4. Be sure to locate and place rack nuts along the front outside face of the vertical column before placing each component on its rails or base. The pre-positioning of rack nuts allows the front of the component to be secured to the front of the rack. (Some units use threaded inserts or bar nuts, and require no rack nuts to secure the unit to the rack.)
5. Mount each unit on its accompanying rails, brackets, or slides.

CAUTION	A tip-over hazard exists. Servers are heavy and may be awkward to position on their mounting rails. Therefore, always minimize the weight to be lifted into the rack by removing power supplies and hard disk drives.

   When each component is correctly secured in the rack, replace disk drives and power supplies and add the front panel (bezel) to the unit.

6. Proceed with units one by one, from the bottom of the rack to the top. Fill any gaps with filler panels.

10. Connect and Route Cables

NOTE	Illustrated information about cabling the HP NetServer LH 3000r in the rack is available in Chapter 3 of this *Reference Guide*, which describes the procedures for connecting and routing cables.

Generally, do the following to ensure cables are correctly connected and managed:

Prepare to Cable the HP NetServer LH 3000r

- Determine which components will be connected to each server.
- Attach Cable Guides to the rack column. See instructions included with Cable Guides.
- Attach Cable Management Arm to rear of server and to the rack column.

- Determine configurations for and mount the PDU (Power Distribution Unit or Units).

Connect the LH 3000r Data Cables to Peripheral Components

- Plan where data connections are to be made.
- Attach data cables to the server. Mark the ends of data cables with colored tie-wraps and labels supplied with each server. This simplifies attaching cables later in the procedure.
- Provide sufficient cable length to allow servers to be extended from the rack for maintenance.
- Attach data cables to their respective components.

Cable the LH 3000r for Power

- Connect each component to a Power Distribution Unit (PDU).
- Connect each PDU to an Uninterruptible Power Supply (UPS) (optional)
- Connect PDU or UPS -- if present -- cables to branch circuits.

Managing and Routing Cables

- Route cables through the Cable Management Arm and tie-wrap them in place.
- Route cables through Cable Guide and tie wrap them in place.

Powering Up and Powering Down the Components in the Rack

- Follow the power up sequence. See "Power Up Sequence" in Chapter 3.
- If it becomes necessary to bring the server power down, follow the "Power Down Considerations" in Chapter 3.

11. Configure the System, Install Doors and Side Panels

At this point, refer to the NetServer user or installation manual and configure the system.

Install front and rear doors as required, and mount side panels. Look for detailed instructions and illustrations with the rack enclosure and components.

2 Rack Cabling References

Rack Configuration Tools

Selected reference material derived from HP's rack configuration tools is published in this chapter for convenience including the following:

- necessary and optional components
- rack power subsystem configuration and placement
- current and power requirements
- discussion of component location in the rack
- routing cables through the Cable Management Arm and Cable Guide
- cooling requirements and air flow

HP rack configuration tools are available on the worldwide web. Enter the following URL in your browser:

`www.hp.com/go/netserver`

At that Web site, search for "configuration tools". Look for Rack Configuration, Rack Assistant, and Order Assistant.

You can read about the tools or download copies for installation. These tools can be used to plan a rack configuration for the components of your system.

Power Cabling References and Guidelines

Power Considerations for the HP NetServer LH 3000r

The HP NetServer LH 3000r can be configured in a wide range of voltages from 100 - 240 VAC. Power supply (UPS) and distribution (PDU) components are available to support these configurations. A Redundant Switch is also available.

Details of power considerations for the HP NetServer LH 3000r include:

- the appropriate power cord(s) for each server is (are) shipped according to voltage requirements; refer to Table 2-2 for details
- each power supply installed in the HP NetServer LH 3000r uses a separate jumper cord
- available in 100/120, 200/208, and 220/230/240 VAC configurations for the U. S. market
- available in either 200/208 VAC or 220/230/240 VAC configurations for international markets
- Uninterruptible Power Supply (UPS) models rated at 3000 Volt Amps (2250 Watts) are available for each voltage range; and a 2200 Volt Amp (1600 Watts) UPS is available for 110/120 and 220/230/240 VAC (see Table 2-1)
- at 100/120 VAC, a wide range Power Distribution Unit (PDU) rated at 16 A is available (9 outlets)
- for both 200/208 and 220/230/240 voltages, a wide range Power Distribution Unit (PDU) model rated at 16 Amps is available; a 10-Amp-rated extension PDU is also available (see Figure 2-1)
- one or more PDUs can be used in each rack enclosure, depending upon requirements for power, current, and number of receptacles (see Table 2-4.)

Power Cables and Components Available

When components are installed in a rack, a power supply subsystem for the rack is required. HP recommends the NetServer LH 3000r be connected as follows:

- connected to a Power Distribution Unit (PDU) -- see Figure 2-1
- through an Uninterruptible Power Supply (UPS) -- see Table 2-1
- to a properly protected branch circuit or circuits -- see "Site Preparation -- Circuit Breakers" in Chapter 1

NOTE	A Redundant Switch is available for use between the UPS and the branch circuit or between the PDU and the branch circuit. More information is listed in Table 2-2 and in Appendix B.

Table 2-2 lists details of the cables, components, plugs and receptacles for the rack power supply subsystems for the HP NetServer LH 3000r.

Table 2-1. UPS Models and Power Ratings

Uninterruptible Power Supplies

APC Model	Voltage	Power (VA)[1]	Power (Watts)[2]
NS3000RM3U	100/200 VAC	3000	2250
NS2200RM3U	100/120 VAC[3]	2200	1600
NS3000RMT3U	200/208 VAC	3000	2250
NS2200RMI3U	230/240 VAC	2200	1600
NS3000RMI3U	230/240 VAC	3000	2250

Note 1. Ensure UPS Volt Amps rating is not exceeded. Add power in Volt Amps of each component and connect no more than those the UPS supports.

Note 2. Also ensure UPS Wattage rating is not exceeded. Add power in Watts of each component and connect no more than those the UPS supports.

Note 3. Consult American Power Conversion Corporation (APC) for information on 100 V UPS for Japan.

Table 2-2. LH 3000r Plugs and Receptacles Reference

	100/120 VAC	200/208 VAC	230/240V
LH 3000r Jumper Cord	8120-8378 NEMA 5-15 plug, 90" (2.3 m), 16 AWG	included C13 to C14, 2.5 m	included C13 to C14, 2.5 m
RackStorage/12 - /12FC and PDU Jumper Cord	E7742A, 90 inch (2.5 m), C13 to C14	E7742A, 90 inch (2.5 m), C13 to C14	E7742A, 90 inch (2.5 m), C13 to C14
PDU Model No.	E7675A (16 amp)	E7671A (16 amp) E7672A (16 amp, cord, and 10 amp)[4]	E7671A (16 amp) E7672A (16 amp, cord, and 10 amp)[4]
Can PDUs be "Daisy Chained"?	No	Yes, 10 amp plugs into 16 amp (use to extend the number of receptacles)[4]	Yes, 10 amp plugs into 16 amp (use to extend the number of receptacles)[4]
PDU cord style	Detachable	Detachable	Detachable
Recommended PDU linecord for recommended UPS	E7802A, 4.5 m NEMA 5-20P to C19 **Notes 1, 2**	E7803A, 4.5m, with NEMA L6-20P plug to C19	E7804A, 4.0m, with IEC C20 to C19 plug
Alternate PDU linecords for installations without a UPS	E7802, 4.5 m Nema 5-20P to C19 **Notes 1, 3**	E7803A, 4.5m, NEMA L6-20P to C19	E7806A, 4.5 m, C19 to unterminated
		E7805A 4.5 m, NEMA L6-30P to C19	E7804A, 4.5 m, C20 to C19
			E7809A, 4.5 m, CEE 7/7 - C19[5]
APC UPS Model	NS2200RM3U NS3000RM3U **Notes 1, 2**	NS3000RMT3U	NS2200RMI3U or NS3000RMI3U
APC Redundant Switch between PDU and Source (No UPS)	SU042-1 with captive L5-30P line cords and E7802A, 4.5 m, NEMA 5-20P to C19 cords to PDU	SU045-1 with captive L6-20P line cords and E7803A, 4.5 m, L6-20P to C19 cord to PDU	SU044-1, C20 inputs, country-specific C19 cords, and E7804A, 4 m, C20 to C19 cord to PDU
APC Redundant Switch between UPS and Source	SU042-2 with captive L5-30P line cords and captive UPS L5-30P connect to L5-30R cord in switch[6]	SU045-1 with captive line cords, captive UPS L6-20 P connects to L6-20R in switch[6]	SU044-1, C20 inputs, country-specific C19 cords, and E7804A, 4 m C20 to C19 jumper cord to UPS[6]

See Notes Next Page

Notes to Table 2-2.

Note 1. For 100 VAC Systems, separately-orderable cables and UPS are available from American Power Conversion Corporation.

Note 2. Consult American Power Conversion Corporation (APC) for model number of 100 VAC unit.

Note 3. For 100 VAC, consult local electrical codes and order a PDU power cord with appropriate connector from American Power Conversion Corporation (APC).

Note 4. Limit the 200 - 240 VAC, 10-amp PDU to 10 amps of capacity, plug it into the 200 - 240 VAC 16-amp PDU, and limit both together to 16 amps of capacity.

Note 5. The CEE 7/7 cord is fused for 13-amp loads, and limits the PDU to 13 amps of total supply.

Note 6. The circuit load should be limited to the VA rating of the UPS when this switch is used.

Power Distribution Units

Three types of Power Distribution Units (PDU) are currently available for the LH 3000r, as follows:

- The 120 VAC PDU (HP product number E7675A) fits either horizontally between the columns of the rack or vertically along the outside edge of the vertical column. See Figure 2-2. This PDU is rated 16-amps unit with nine available NEMA 5-15R receptacles and one IEC 320 C13 fan receptacle.
- The wide-range 200/240 VAC PDU (HP product number E7671A) fits either horizontally between the columns of the rack or vertically along the outside edge of the vertical column. See Figure 2-2.This PDU is rated 16 amps and has six available C-13 receptacles and two C-19 receptacles.
- A wide-range 200/240 VAC, 10-amp extension (HP product number E7670A) can be plugged into the 16-amp unit to extend the number of C-13 receptacles by an additional 10. This accessory also allows positioning of receptacles at various levels in the rack. (To order the 16-amp unit with its 10-amp extension and jumper cable, order HP part number E7672A.)

NOTE The extension PDU (E7670A) only increases the number of available receptacles. The total current carrying capacity still is limited to 16 amps for the two PDUs, when daisy chained. In addition, the extension PDU is limited to carrying only 10 amps.

Placement of PDU

To determine where the PDU mounts, eliminate positions directly behind equipment listed in Table 2-3. (PDUs conflict with these units when mounted in the same space). Then decide the most convenient location. The PDU can be mounted vertically using the non-EIA mounting holes on the outer edges of the vertical columns. Or it can be mounted horizontally between the columns.

When monitor and UPS units are present, the PDU can be horizontally mounted across the rack opening, behind one of these units. However, PDUs can also be mounted vertically on the opposite side of the rack from the door hinges.

Table 2-3. PDU Placement is Not Recommended behind These Units

HP Product Name	Can PDU Be Mounted Behind?	Reason
HP NetServer LH 3000r and LC 2000r	Horizontal Mounting Not Recommended	Interferes with Hot-Swappable Power Supplies and Cable Management Arms
HP NetServer LXr 8000 and LXr 8500	Horizontal Mounting Not Recommended	Interferes with Hot-Swappable Power Supplies and Cable Management
HP NetServer LH 3r and LH 4r	Horizontal Mounting Not Recommended at Bottom of LH 3r and LH 4r	Interferes with Hot-Swappable Power Supplies
HP FiberChannel 30	Not Feasible	Mechanically conflicts
HP NetServer Rack Storage/12 or /12FC	Horizontal Mounting Not Recommended	Interferes with Hot-Swappable Power Supplies

Power Distribution Unit Types

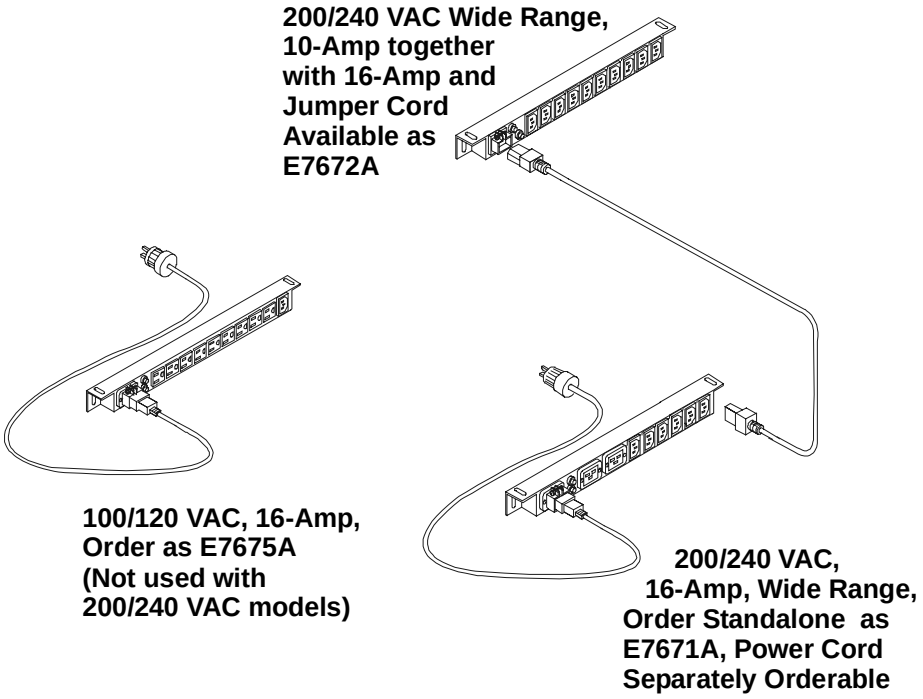
200/240 VAC Wide Range, 10-Amp together with 16-Amp and Jumper Cord Available as E7672A
100/120 VAC, 16-Amp, Order as E7675A (Not used with 200/240 VAC models)
200/240 VAC, 16-Amp, Wide Range, Order Standalone as E7671A, Power Cord Separately Orderable

Figure 2-1. PDU Configurations

The 200/240 VAC, wide-range Power Distribution Unit (PDU) can be mounted in several configurations with the LH 3000r. One of these configurations is shown in Figure 2-2. Others are listed and illustrated throughout Chapter 3.

How to Position the PDU

Count the receptacles needed for each unit in the rack, notice where the PDUs can be most conveniently located, and decide whether to orient the PDU vertically or horizontally.

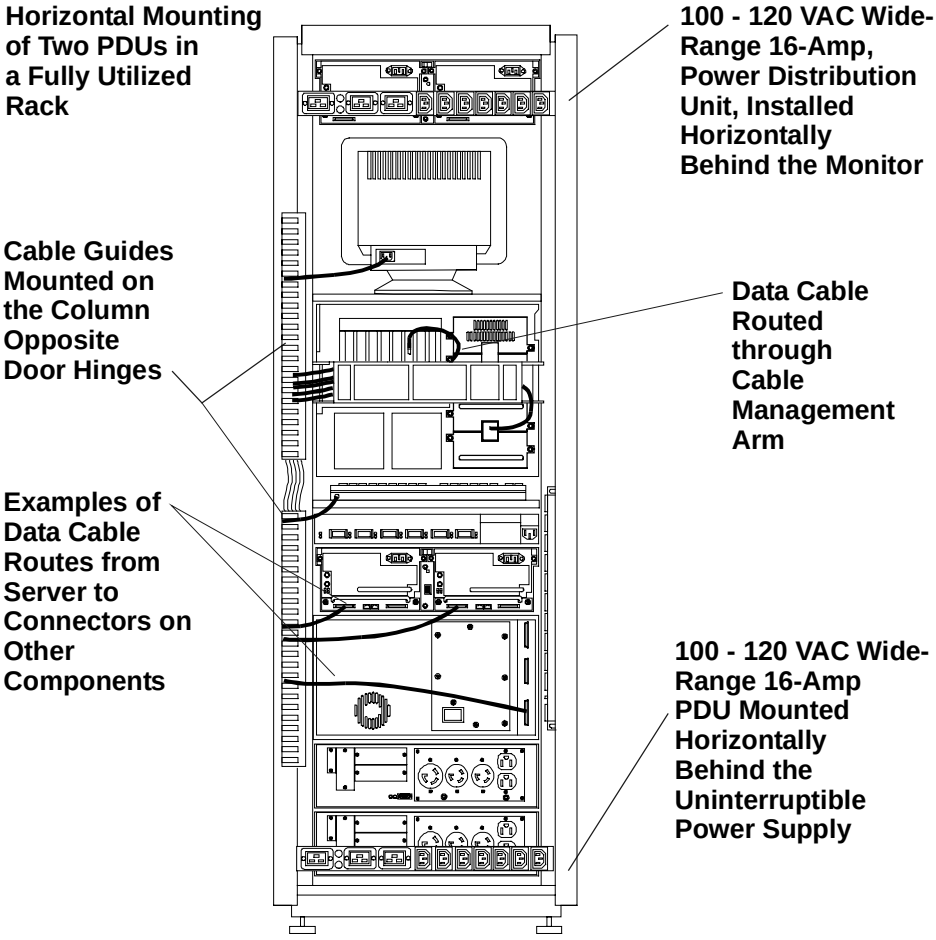
Horizontal Mounting of Two PDUs in a Fully Utilized Rack
100 - 120 VAC Wide-Range 16-Amp, Power Distribution Unit, Installed Horizontally Behind the Monitor
Cable Guides Mounted on the Column Opposite Door Hinges
Data Cable Routed through Cable Management Arm
Examples of Data Cable Routes from Server to Connectors on Other Components
100 - 120 VAC Wide-Range 16-Amp PDU Mounted Horizontally Behind the Uninterruptible Power Supply

Figure 2-2. Mounting a Pair of PDUs Horizontally (Rear View)

Guidelines for Powering the LH 3000r in a Rack

Four Possible 200/240 VAC Wide Range PDU Configurations

Use of four possible 200/240 VAC PDU configurations depends upon the power requirements of the devices in the rack. Table 2-4 shows how to determine how many PDUs are supplied with each rack configuration. In configurations that use a wide-ranging 10-amp PDU, it will always be plugged into a wide ranging 16-amp PDU.

Table 2-4. Number, Type, and Ratings of 200/240 VAC PDUs

Wide Range 16 Amp	Wide Range 10 Amp (**Note 3**)	Part Numbers	C-19 Receptacles	C13 Receptacles	Total Amps
1	0	E7671A (**Note 1**)	2	6	16
1	1	E7672A (**Note 2**)	2	15	16
2	0	E7671A + E7671A	4	12	32
2	1	E7671A + E7672A	4	21	32

Note 1 The E7671A includes one 16 amp PDU. The cord that attaches it to the power source must be ordered separately, specifying the cord end required.

Note 2 The E7672A includes one 16 amp PDU, one 10 amp PDU, and the cord that attaches them together. The cord that attaches the 16 amp PDU to the power source must be ordered separately, specifying the cord end required.

Note 3 The 10-amp PDU can be ordered as an accessory using part number E7670A. The cord that connects it to the 16-amp PDU must be ordered separately.

Guidelines for PDU Placement

Your wide-range PDU configuration is determined using Table 2-4 and by application of the following guidelines:

1. The first configuration in the list in Table 2-4 that meets receptacle count, current requirements, and power requirements is recommended by rack configuration tools and is supplied, unless the purchaser has overridden this choice.
2. The total power drawn by all components in the rack is accumulated by rack configuration tools, and a second UPS is recommended if wattage of the first is exceeded.
3. One 16-amp PDU is supplied for each Uninterruptible Power Supply (UPS) in a rack.
4. (a) When several HP Rack Storage/12 or Rack Storage/12FC units are in the same rack, use of two wide-range 16-amp and one wide-range

10-amp PDU may not provide sufficient receptacles. In this case, use the Y-cable to connect HP Rack Storage/12 or Rack Storage/12FC units to the PDUs.

(b) When required, a pair of Y-cables are supplied per pair of Rack Storage/12 or Rack Storage/12FC units. That is, two Y-cables are supplied for two units.

(c) Each Y cable connects either the two right power receptacles or the two left power receptacles of a pair of HP Rack Storage/12 or Rack Storage/12FC units to one receptacle on the PDU.

Table 2-5. Receptacles Needed for Units

Component	Receptacles Required
HP NetServer LH 3000r	one[1] for each set of two power supplies, a second[1] when the optional redundant power supply is installed
HP Rack Storage/12	two C13 or use Y-Cable[2]
All other devices	one C13

1. For 110/120 VAC, NEMA 5-15 R, for 200/240 VAC, C13
2. Two Y-Cables may be used to connect two Rack Storage/12 units to two C13 receptacles.

Power and Current for Estimating Supply Needs

When plugging devices into a PDU and UPS, do not exceed the current capacity of the PDU nor the power output UPS. Tables 2-6 and 2-7 show the current requirements of the common rack mounted devices.

Rack configuration utilities available from HP can help you plan the layout of your rack. Full parts lists as well as diagrams of component positions and details of power ratings are available. Refer to these if they are available. (See "Rack Configuration Tools" in this chapter.)

Table 2-6. 100 VAC Power and Current: Approximate Current Requirements of Rack Optimized Devices and Components

Device (Notes 1, 2, 3)	Input Power (VA)	Input Power (W)	100v IRMS (Amps)
HP NetServer LC 2000r	545	540	5.5
HP NetServer LH 3000r	833	825	8.3
HP NetServer LH 6000r	1177	1166	11.7
HP NetServer LT 6000r	833	825	8.3
HP NetServer LPr	530	305	5.3
HP NetServer LXr 8000 and LXr 8500	-	-	Not Supported
HP NetServer LH 4r	1170	1140	11.7
HP NetServer LH 3r	650	626	6.3
HP NetServer LXr Pro8	-	-	Not Supported
HP NetServer LXr Pro	450	446	4.5
HP Fibre Channel Hub D6976A	140	125	0.7
HP Rack Storage/12FC	548	537	5.5
HP Rack Storage/12	548	537	5.5
Monitor (14-inch)	125	88	1.3
Monitor (15-21-inch)	200	140	1.4
DLT Library	140	98	1.4
DLT Mechanism	50	35	0.5
HP SureStore Autoloader 418	214	150	2.1
DAT 24x6e	16	11.2	0.2
DAT 24e	6	4.2	0.1
Console Switch	42	29	0.4

Note 1 Indicated current ratings are approximate, for use in selecting PDU and UPS components, and may not reflect actual measured amounts.

Note 2 For a full list of power ratings, see the rack configuration utilities (for instance, Rack Assistant) on the HP Web Site.

Note 3 Ratings from previously published estimates are updated.

Table 2-7. 120 VAC Power and Current: Approximate Current Requirements of Rack Optimized Devices and Components

Device (Notes 1, 2, 3)	Input Power (VA)	Input Power (W)	120v IRMS (Amps)
HP NetServer LC 2000r	531	525	4.5
HP NetServer LH 3000r	815	806	6.7
HP NetServer LH 6000r	1153	1141	9.5
HP NetServer LT 6000r	815	806	6.7
HP NetServer LPr	552	295	4.6
HP NetServer LXr 8000 and LXr 8500	-	-	Not Supported
HP NetServer LH 4r	1160	1130	9.7
HP NetServer LH 3r	650	626	5.3
HP NetServer LXr Pro8	-	-	Not Supported
HP NetServer LXr Pro	450	446	3.8
HP Fibre Channel Hub D6976A	140	125	0.7
HP Rack Storage/12FC	541	530	4.5
HP Rack Storage/12	541	530	4.5
Monitor (14-inch)	125	88	1.0
Monitor (15-21-inch)	200	140	1.2
DLT Library	140	98	1.2
DLT Mechanism	50	35	0.4
HP SureStore Autoloader 418	214	150	1.8
DAT 24x6e	16	11.2	0.1
DAT 24e	6	4.2	0.1
Console Switch	42	29	0.3

Note 1 Indicated current ratings are approximate, for use in selecting PDU and UPS components, and may not reflect actual measured amounts.

Note 2 For a full list of power ratings, see the rack configuration utilities (for instance, Rack Assistant) on the HP Web Site.

Note 3 Ratings from previously published estimates are updated.

Table 2-8. 200/208 VAC Power and Current: Approximate Requirements of Rack Optimized Devices and Components

Device (Notes 1, 2, 3)	Input Power (VA)	Input Power (W)	208v IRMS (Amps)
HP NetServer LC 2000r	516	506	2.5
HP NetServer LH 3000r	792	777	3.7
HP NetServer LH 6000r	1120	1099	5.3
HP NetServer LT 6000r	792	777	3.7
HP NetServer LPr	640	285	3.2
HP NetServer LXr 8000 and LXr 8500[4]	1121	1077	5.6
HP NetServer LH 4r	1130	1100	5.7
HP NetServer LH 3r	650	626	3.2
HP NetServer LXr Pro8	980	970	4.9
HP NetServer LXr Pro	450	446	2.3
HP Fibre Channel Hub D6976A	140	125	0.7
HP Rack Storage/12FC	522	512	2.6
HP Rack Storage/12	522	512	2.6
Monitor (14-inch)	125	88	0.6
Monitor (15-21-inch)	200	140	0.7
DLT Library	140	98	0.7
DLT Mechanism	50	35	0.3
HP SureStore Autoloader 418	214	150	1.1
DAT 24x6e	16	11.2	0.1
DAT 24e	6	4.2	0.1
Console Switch	42	29	0.2

Note 1 Indicated current ratings are approximate, for use in selecting PDU and UPS components, and may not reflect actual measured amounts.
Note 2 For a full list of power ratings, see the rack configuration utilities (for instance, Rack Assistant) on the HP Web Site.
Note 3 Ratings from previously published estimates are updated.
Note 4 Ratings assume upgrade from HP NetServer LXr 8000 to HP NetServer LXr 8500 with no change to rack power subsystem.

Table 2-9. 230/240 VAC Power and Current: Approximate Requirements of Rack Optimized Devices and Components

Device (Notes 1, 2, 3)	Iput Power (VA)	Input Power (W)	230/240v IRMS (Amps)
HP NetServer LC 2000r	514	504	2.3
HP NetServer LH 3000r	790	774	3.4
HP NetServer LH 6000r	1117	1095	4.8
HP NetServer LT 6000r	790	774	3.4
HP NetServer LPr	644	285	2.8
HP NetServer LXr 8000 and 8500[4]	1121	1077	4.9
HP NetServer LH 4r	1120	1100	4.9
HP NetServer LH 3r	650	626	2.7
HP NetServer LXr Pro8	980	970	4.3
HP NetServer LXr Pro	450	446	2.0
HP Fibre Channel Hub D6976A	138	125	0.6
HP Rack Storage/12FC	518	507	2.3
HP Rack Storage/12	518	507	2.3
Monitor (14-inch)	125	88	0.5
Monitor (15-21-inch)	200	140	0.6
DLT Library	140	98	0.6
DLT Mechanism	50	35	0.2
HP SureStore Autoloader 418	214	150	0.9
DAT 24x6e	16	11.2	0.1
DAT 24e	6	4.2	0.1
Console Switch	42	29	0.2

Note 1 Indicated current ratings are approximate, for use in selecting PDU and UPS components, and may not reflect actual measured amounts.
Note 2 For a full list of power ratings, see the rack configuration utilities (for instance, Rack Assistant) on the HP Web Site.
Note 3 Ratings from previously published estimates are updated.
Note 4 Ratings assume upgrade from HP NetServer LXr 8000 to HP NetServer LXr 8500 with no change to rack power subsystem.

Data Cabling References and Guidelines

A series of positioning rules is used in the HP rack configuration tools to help determine where each component is placed in multiple rack layouts.

Key Cabling Guidelines Used in Developing a Rack Layout

The following discussion is intended to support your understanding of how your rack order was arrived at. It also discusses how rack layouts affect the attachment and routing of cables.

This summary of key cabling guidelines reflects information available from HP rack configuration tools located on the Worldwide Web, path as follows:

```
http://www.hp.com/go/netservers--select
"configuration tools"
```

Key guidelines help you to ensure that:

- component placement from rack to rack is consistent
- that the Cable Management Arm is correctly positioned and cables are routed so that the HP NetServer can be extended for service by trained personnel
- power supplies and distribution units supplied with the rack assembly can meet requirements for power, current, and number of receptacles

Cable Guide Placement Considerations Due to Data Cable Lengths

- Data cable lengths limit how far components can be located away from one another. Component placement depends upon whether the cables are routed to the left or to the right side of the rack after being connected with the server. And this in turn depends on Cable Guide placement. The left side is recommended for mounting of the Cable Management Arm and Cable Guides.
- Cable Guide placement is determined by where the doors are hinged. Doors can be mounted to swing from either side of the rack. Locate the Cable Guide on the same side of the rack as the door hinge hardware. Locate the PDU opposite the cable guide (if mounted vertically), on the same side as the door latch hardware. PDU location can be changed to allow other possible cable routing.
- Data connections to devices are made with cables of various lengths. Be sure to check the component cable length before mouning a component in the rack.

- Ensure the monitor cables and mouse cables are long enough to allow the NetServer to be extended at the same time the keyboard tray is pulled out. Use locally available extensions if necessary.
- The mounting distances provided in rack configuration tools assume cables between the servers and connected devices provide for the Cable Management Arm (for the LH 3000r).

Cooling Requirements for the LH 3000r

For optimum operational results, the HP NetServer LH 3000r should be kept at an operating temperature between 68 and 72 degrees F. Minimally, the interior of the NetServer must be kept between 41 and 95 degrees F, 5 - 35 degrees C. Remember that ambient temperatures may be lower than the temperature inside the server.

Because of the heat generated by the HP NetServer LH 3000r, both the front and rear doors of the rack must have perforated surfaces. (Alternatively, both front and rear doors can be left off the rack.) Air flow in racked units flows through front and rear. If you are installing the HP NetServer LH 3000r in a rack that has solid front and rear doors, you must either replace the doors on your rack with perforated doors or remove solid doors to ensure proper air flow.

Because of the high capacity fans installed in the HP NetServer LH 3000r, no external (rack) exhaust fan is needed with this unit. The rack must have perforated front and rear doors, or no doors.

3 Procedure for Connecting and Routing Cables to the LH 3000r

Step 1: Prepare to Cable the HP NetServer LH 3000r

Assess How Components Will be Connected to the Server

You may find the following steps to be helpful before you begin cabling:

- Review the layout of the rack installation generated with Hewlett-Packard rack configuration tools, such as Rack Assistant (available at **`www.hp.com/go/netservers`**).
- Consider the cabling guidelines discussed in Chapter 2 of this *Reference Guide* in the section "Data Cabling References and Guidelines."
- Review the plan for your rack power subsystem, considering how you will provide failure resistance (see Appendix B, "Considerations in Mounting the Redundant Switch"), interim power (see Table 2-1 on Uninterruptible Power Supplies) and distribution (see the section of Chapter 2 titled "Power Distribution Units").

Check that you have completed the mounting of the Cable Guides, Cable Management Arms, and Power Distribution Units as noted below. See Figure 2-2 for an example illustration showing how these three items may look when mounted.

Attach Cable Guide to Rack Column

Using the instructions included, attach the two Cable Guides to the rack column.

Mount the Cable Management Arm

The HP NetServer LH 3000r includes a Cable Management Arm. Mount the arm by following the instructions in the *HP NetServer LH 3000/3000r Installation Guide* which accompanies your unit. Cable routing details are included in the section of this chapter titled "Cable Management."

Mount Power Distribution Units

Plan the location of the Power Distribution Unit or Units (PDU) by reference to amperage, power, and the number of receptacles. See Chapter 2, the section entitled "Wide Range PDU Configurations," particularly Table 2-4.

Follow mounting instructions included with your power distribution units. Notice these cannot be installed behind some equipment. See Table 2-3.

Step 2: Connect the LH 3000r Data Cables to Peripheral Components

Plan Data Connections

Plan where data connections are to be made and locate cables to be used. There are hook-and-loop cable ties and also colored pairs of cable markers with labels in each server package.

Attach data cables to the boards and ports of the server. Use the colored plastic cable ties to identify both ends of the cable. Support cables with hook-and-loop cable ties.

Overview of LH 3000r Data Connections

This section shows examples for how to connect data cables between the server and mass storage units. For more information on such connections, see the *User* or *Installation Guide* for the HP Rack Storage/12 or the HP Rack Storage/12FC.

Figure 3-1, "Overview of Data Cabling of the HP NetServer LH 3000r to the Rack Storage/12" shows a set-up you might assemble before running HP NetServer Navigator to configure your server. Figure 3-2 shows a similar set-up for the Rack Storage/12FC.

See the *HP NetServer LH 3000/3000r Installation Guide* for more information on setting up the system.

CAUTION	Cables with thumb-screws should only be snug or finger-tight. Excessive tightening could damage the mating connector.

Figure 3-1 shows the connections of the mouse, video, and keyboard cables from the devices through the HP Console Switch, to the server. Alternate cabling paths for SCSI cables from the server to the mass storage units are also shown.

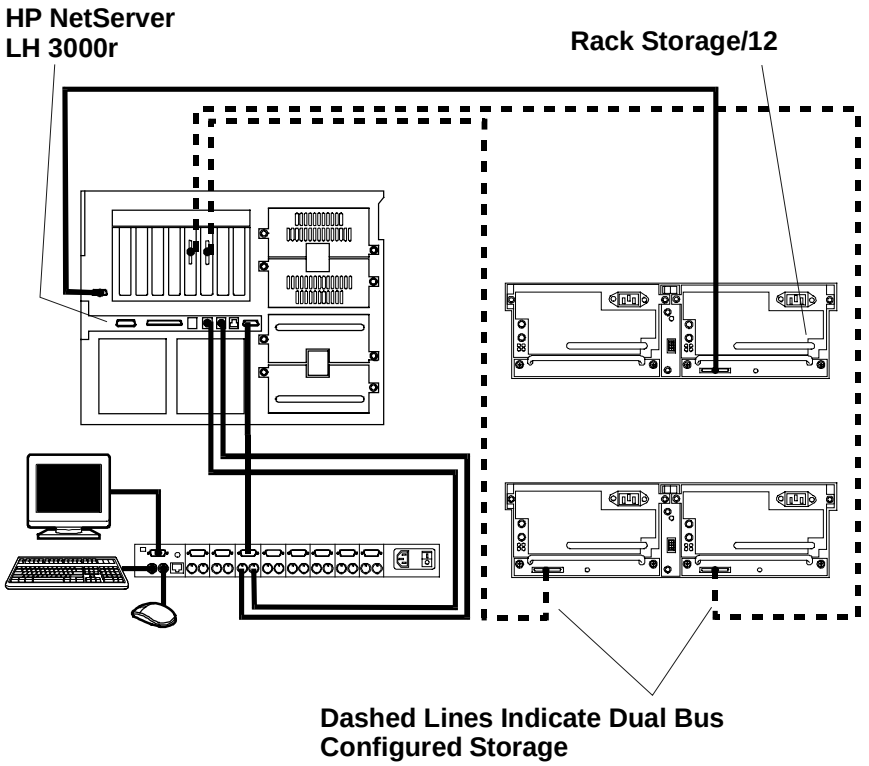

Figure 3-1. Overview of Data Cabling of the HP NetServer LH 3000r to an HP Rack Storage/12

NOTE Figure 3-1 shows an HP Console Switch, which is not necessary for configuring the system, but is shown for informational purposes.

NOTE The configuration in Figure 3-1 requires 1 UPS and 1 PDU at 120 V, 200/208 V, and at 220/230/240 V.

For 100 VAC applications, a 3000 VA UPS is required and 2 PDUs must be in place.

Figure 3-2 shows an HP NetServer LH 3000r connected in Dual Active Mode to a Rack Storage/12FC.

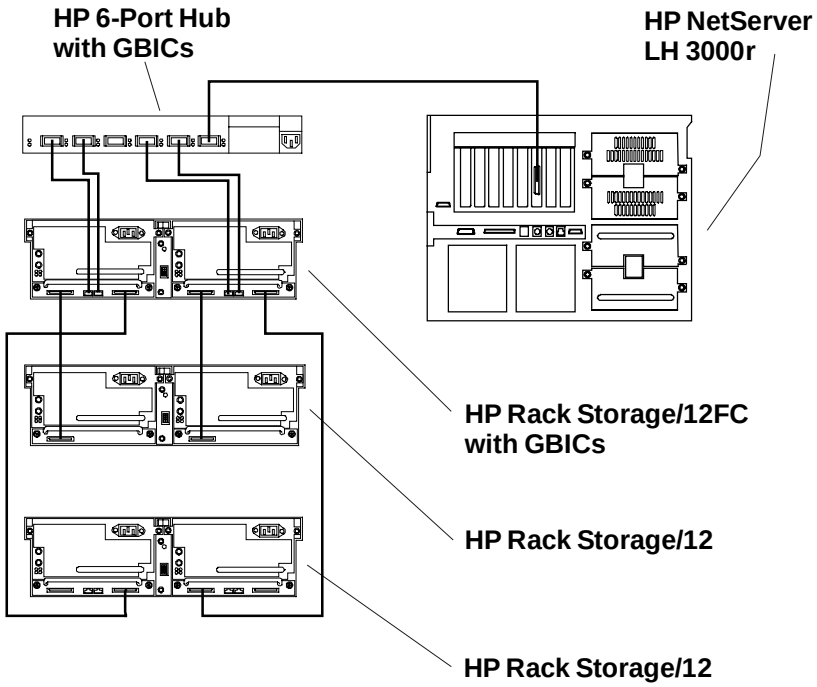

Figure 3-2. Overview of Data Cabling of the HP NetServer LH 3000r to the Rack Storage/12FC

NOTE The configuration in Figure 3-2 requires different power system configurations at different voltages, as shown below:

Voltage	Power System Requirements
100	2 PDUs, 3000 VA UPS
120	2 PDUs, 3000 VA UPS
200/208	1 PDU, 3000 VA UPS
230/230/240	1 PDU, 3000 VA UPS

For more information on data cabling with the Rack Storage/12FC, see the *HP Rack Storage/12 FC Installation Guide.*

Attach Data Cables to the Server

1. Locate SCSI connections, label both ends of the SCSI cables, and connect one end of each one to the server. Tighten captive screws on SCSI connectors to secure the cable connector to the server connector.

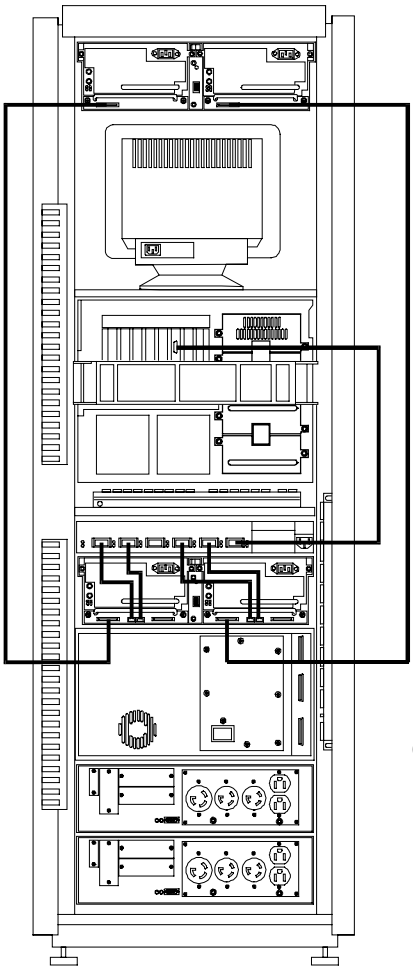

Figure 3-3. Connecting the Data Cables between the LH 3000r and Rack Storage/12FC

2. Locate any network and remote management connections from hubs, routers and other sources and connect their cables to corresponding server connectors.
3. Locate the cable that will attach the serial port on the Uninterruptible Power Supply (UPS) (if present) and plug in the server end.
4. Attach the video cable to the video port on the server. Attach the mouse and keyboard cables to the server. If you are using one keyboard, mouse,

and monitor for more than one server, attach the cables for the HP Console Switch to the server ports for video, mouse, and keyboard ports.

Check Whether Cable Lengths Limit Distances between the Server and Storage

Sometimes data cable length or availability limits the distance between a peripheral component (such as the UPS or video monitor) and its associated server. Guidelines used by rack configuration tools in generating rack layouts take possible distance limitations into account. Check power and data cords supplied with peripherals to ensure you have cables that are long enough to attach each device.

NOTE	Be sure to leave sufficient data cable length to allow for cable management. See the section of this chapter “Managing and Routing Cables” and refer to Figure 3-10.

Attach Data Cables to Other Components

1. Using the colored cable ties and labels attached to each data cable previously, connect each cable to its component.
2. Fasten cable connectors to each component using captive screws.

Step 3: Cable the LH 3000r for Power

When all components have been mounted in the rack and their data cables connected, then the power cables can be attached.

Attaching Server and Component Power Cables

1. Make sure any manually switchable device power switches are off.
2. Attach the power cords for each device.
   - ◊ Plug power cords into the receptacle in the server.
   - ◊ Ensure sufficient cable to fully extend the server and route cables through the Cable Management Arm.
   - ◊ Route the cables through the Cable Guide.
   - ◊ Tie bundles of cables using hook-and-loop cable straps.
3. Plug components into the PDU beginning with the components which are lowest in the rack. If you are using more than one PDU or have a heavily loaded rack, see the section of this chapter entitled "Determining and Balancing Current Draw on Two Circuits in One Rack."

4. For the sake of easy access to the rear of each component, route the associated power cords within the same space (the same set of EIA Units) where the component is located.

   Excess cord can be handled by coiling and tie wrapping unneeded length, and hanging it in the space at the side of the component it connects. When doing so, be sure you allow sufficient slack for access. Also provide for components which can be extended, ensuring the coil does not conflict.

5. Plug the PDU(s) into the UPS or into the site power receptacles. When you are ready to power on the components, see "Power Up Sequence."

Determining and Balancing Current Draw on Two Circuits in One Rack

NOTE Amperage ratings for use in determining and balancing loads on the Power Distribution Unit are shown in Tables 2-6, 2-7, 2-8, and 2-9.

If applicable, use two circuits (each including a Power Distribution Unit and an optional Uninterruptible Power Supply) in one rack. Attempt to balance the current drawn through each circuit. Plan to plug in components with smaller power requirements and connectors so that they alternate between the circuits. In other words, plug one component into one circuit and the next component into the other circuit. For instance, see Figures 3-8 and 3-9.

When (in either the 208 or 230/240 VAC case) a 10-amp PDU is daisy-chained to a 16-amp PDU, determine the load to be placed on each. Plug only those combinations of components into the 10-amp PDU whose overall total current draw is less than 10 amperes. Then be sure that the 16-amp PDU total load, including the daisy-chained 10-amp PDU and any other components, does not exceed 16 amperes.

Add more PDU-UPS circuits to support higher loads.

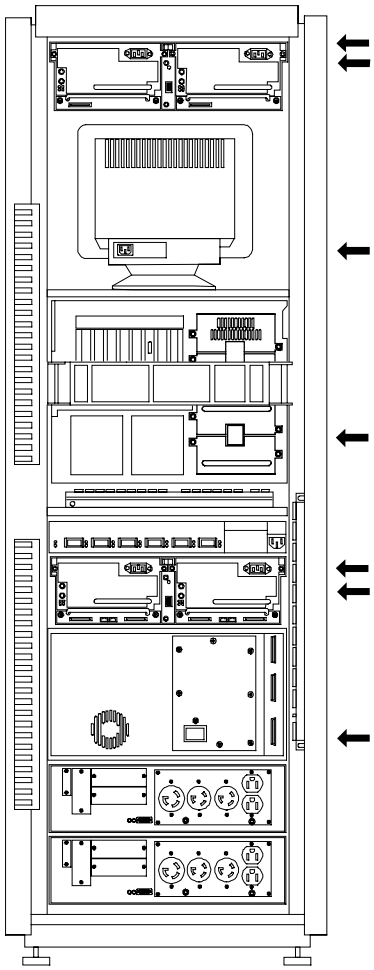

Figure 3-4. Power Connection Locations on a Typical Rack (Rear View)

100/120 VAC Rack Power Configurations

The 120 VAC PDU power configurations are detailed in the recommendations shown below and in Table 3-1 and Figure 3-5.

NOTE	100 VAC configurations are the same as 120 VAC, except for the UPS and the cable which connects the PDU to it. See Table 3-1 and the notes which accompany it.

Connecting the PDU 120 VAC Configuration

The Power Distribution Unit (PDU) plugs into the Uninterruptible Power Supply (UPS) if one is present. The 120 volt PDU uses an E7802A detachable cord with a NEMA 5-20P connector for connections to the receptacles on the right-hand side (viewed from the rear) of the UPS. It connects to the PDU through a C19 connector.

CAUTION	It is not possible to plug one 16-amp, 120 VAC PDU into another. This type of PDU must be plugged directly into a UPS or site AC power circuit. Attempting to plug one of these units into another could result in electrical failure or damage to the equipment.

Alternate 120 VAC Power Configurations

When the 120 VAC PDU is used without a UPS in the rack, the PDU needs one branch circuit with a NEMA 5-20 receptacle.

If neither a UPS nor a PDU are used in the 120 VAC case, plug the components directly into NEMA 5-15 receptacles using the line cords supplied.

If you use a wall socket directly without a UPS or PDU, be sure to check power requirements against the amperage rating of your electrical system. See the section entitled “Site Preparation: Circuit Breakers.” If your electrical system has the capacity to power the components, plug the HP NetServer LC 2000r and mass data storage units into NEMA 5-15 receptacles using the 90 inch (approximately 230 cm) power cords supplied.

Table 3-1. 120 VAC Components

Component[1]	Model	Power (VA)	Power (W)	Current (A)[2]
PDU	E7675A	N/A	N/A	max 16
HP NetServer LH 3000r	D8230A, 533 MHz, 512 MB D8238A, 600 MHz, 256 MB D8246B, 667 MHz, 256 MB	531	525	4.5
HP NetServer Mass Storage Unit	Rack Storage/12 is D5989A Rack Storage/12FC is D5991A	541	530	4.5
HP Console Switch	J1497B	42	29	0.2

Note 1 More ratings are listed in Table 2-7. For a full list of power ratings, see the rack configuration utilities (for instance, Rack Assistant) on the HP Web Site.

Note 2 Indicated current ratings are for use in selecting PDU and UPS components and may not reflect actual measured amounts.

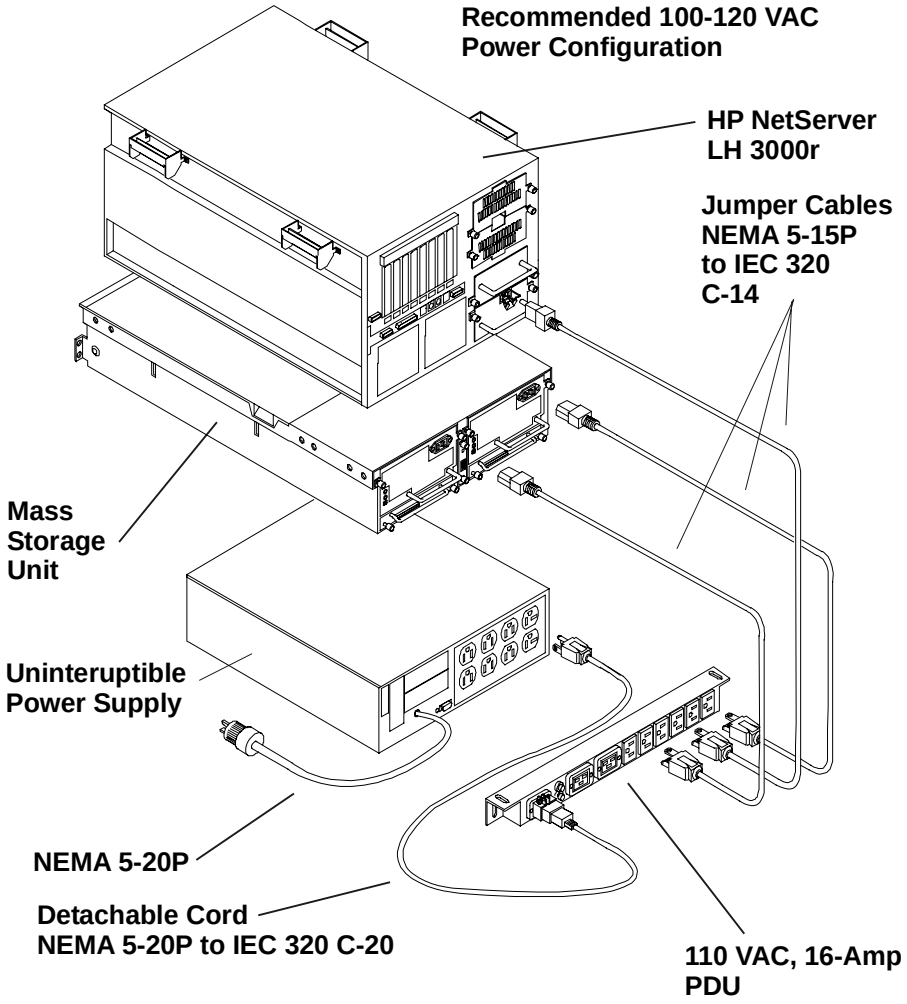

Figure 3-5. 120 VAC Configuration

Figure 3-5 shows a UPS connected to the power grid through a captive cord with a NEMA 5-20P. The UPS has receptacles for use in the rack: two (on the right rear) NEMA 5-20R and six NEMA 5-15R. The PDU connects to the UPS via a detachable cord (NEMA 5-20P to an IEC 320 C20). The 120 VAC PDU has nine NEMA 5-15R and one (at the right) IEC 320 receptacle. The fan (not required if perforated doors--or no doors--are used front and back) plugs into the PDU using the right-most IEC 320 receptacle.

Two 120 V PDUs per UPS Possible

Two 120 VAC PDUs can be plugged into the UPS in this 120 V power configuration. There are also six NEMA 5-15R receptacles in the standard UPS which can be used for equipment in the same rack if needed.

208V PDU Rack Power Configurations

The 208 VAC PDU power configurations appear as shown below in Table 3-2 and Figure 3-6.

Recommended 208 VAC Power Configurations

In the United States, if you are using a UPS, then use PDU model E7671A or E7672A. Attach the IEC 320 C-19 end of the E7801A cord to the PDU and attach the L6-20 end of the same cord to the NEMA L6-20 receptacle on the UPS.

Alternate 208 VAC Power Configurations

In the 208 VAC case, without a UPS, make sure your power system has the capacity to support the power and current needs of the components you will power. (See the section entitled "Site Preparation: Circuit Breakers.") If capacity is adequate, plug the PDU into a 208 V, L6-20 receptacle.

Table 3-2. 208 VAC Components

Component[1]	Model	Power (VA)	Power (W)	Current (A)[2]
208 VAC PDU	E7671A or E7672A	N/A	N/A	max 16
HP NetServer LH 3000r	D8230A, 533 MHz, 512 MB D8238A, 600 MHz, 256 MB D8246B, 667 MHz, 256 MB	516	506	2.5
HP NetServer Mass Storage Unit	Rack Storage/12 is D5989A Rack Storage/12FC is D5991A	522	512	2.6
HP Console Switch	J1497B	42	29	0.2

Note 1 More ratings are listed in Table 2-8. For a full list of power ratings, see the rack configuration utilities (for instance, Rack Assistant) on the HP Web Site.

Note 2 Indicated current ratings are for use in selecting PDU and UPS components and may not reflect actual measured amounts.

Description of the Recommended 208 VAC Configuration

Figure 3-6 shows a UPS connected to the power mains through a captive cord terminated with an L6-20P plug. The UPS has five receptacles for use in the rack: two (on the right rear) NEMA 5-15 providing 110 VAC, two L6-20R, and one L6-30R, providing 208VAC. The E7671A PDU connects to the UPS via a detachable cord with an L6-20P plug. This cord connects to the PDU with an IEC 320 C-19 plug. The 208 VAC PDU has two IEC 320, C-19 and six IEC 320, C-13 receptacles. A second PDU (E7670A) is available, which can be daisy-chained to the 16-amp unit, providing ten more C-13 receptacles.

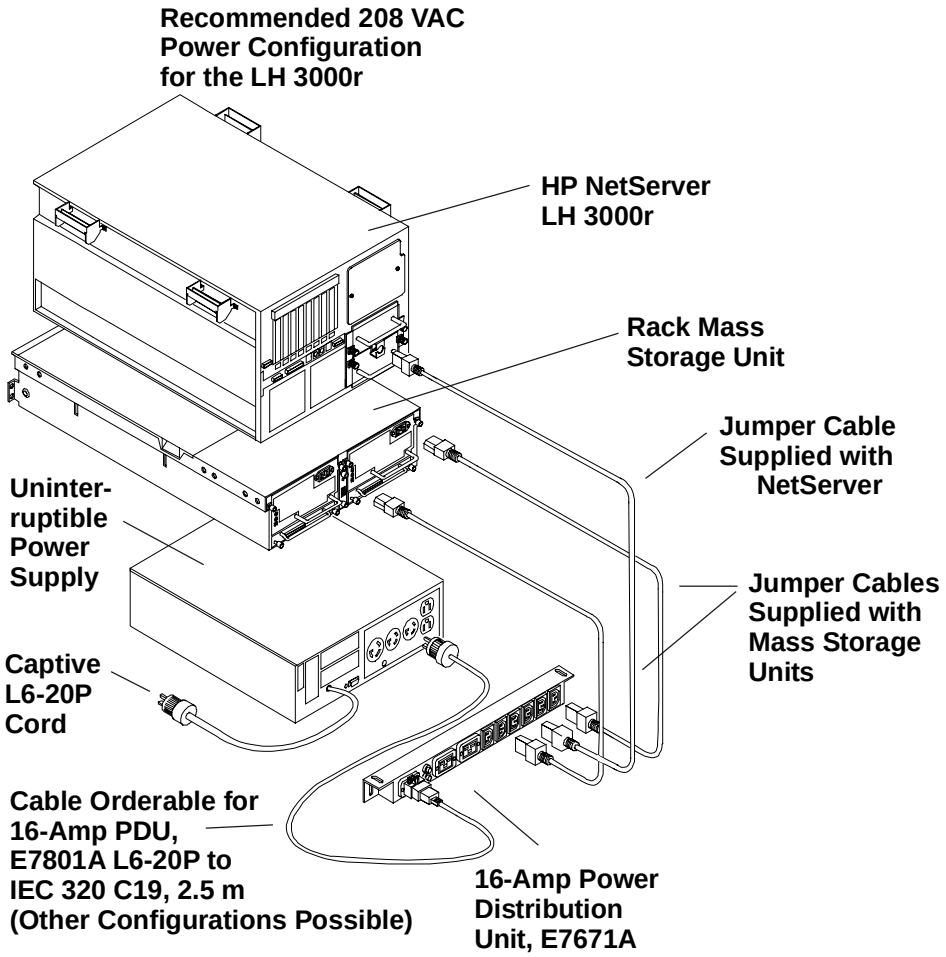

Figure 3-6. 208 VAC PDU Configuration

230/240V PDU Rack Power Configurations

Configurations for the 230/240 VAC, PDU options are shown in the text below, Table 3-3, and Figure 3-7.

230/240 VAC Power Configuration

In a country with a 230/240 VAC power system, the wide range (200/240 V) PDU model E7671A is required. If you are using a UPS, attach the C-19 end of the accompanying power cord to the PDU and attach the C20 end of the same cord to the IEC 320 receptacle in the rear of the UPS.

Alternate 230/240 VAC Power Configuration

When the 230/240 VAC PDU is to be used without a UPS in the rack, the PDU is shipped with a localized power cord.

NOTE	Only localized power cords rated 16A will allow the full 16A rating of the PDU to be used.

For use with 230/240 VAC power mains, direct connection to a junction box is usually necessary. In this case, an unterminated power cord is supplied. Be sure to obey all local electrical code requirements when connecting to the site electrical power supply.

Table 3-3. 230/240 VAC PDU Power and Current

Component[1]	Model	Power (VA)	Power (W)	Current (A)[2]
200/240 VAC PDU	E7671A or E7672A	N/A	N/A	max 16
HP NetServer LH 3000r	D8230A, 533 MHz, 512 MB D8238A, 600 MHz, 256 MB D8246B, 667 MHz, 256 MB	514	504	2.3
HP NetServer Mass Storage Unit	Rack Storage/12 is D5989A Rack Storage/12FC is D5991A	518	507	2.3
HP Console Switch	J1497B	42	29	0.2

Note 1 More ratings are listed in Table 2-9. For a full list of power ratings, see the rack configuration utilities (for instance, Rack Assistant) on the HP Web Site.

Note 2 Indicated current ratings are for use in selecting PDU and UPS components and may not reflect actual measured amounts.

Description of the Recommended 230/240 VAC Configuration

Figure 3-7 shows a UPS connected to the power mains through an attached power cord (appropriate cords are supplied for each country). The UPS has eight IEC 320 receptacles for use with the rack jumper cords. The E7671A PDU connects to the UPS via a detachable line cord, which connects to the PDU via a C-19 plug. This cord connects to the UPS with a C-20 plug. The 200/240 VAC PDU has two IEC 320, C-19 and six IEC 320, C-13 receptacles for connecting rack jumper cords.

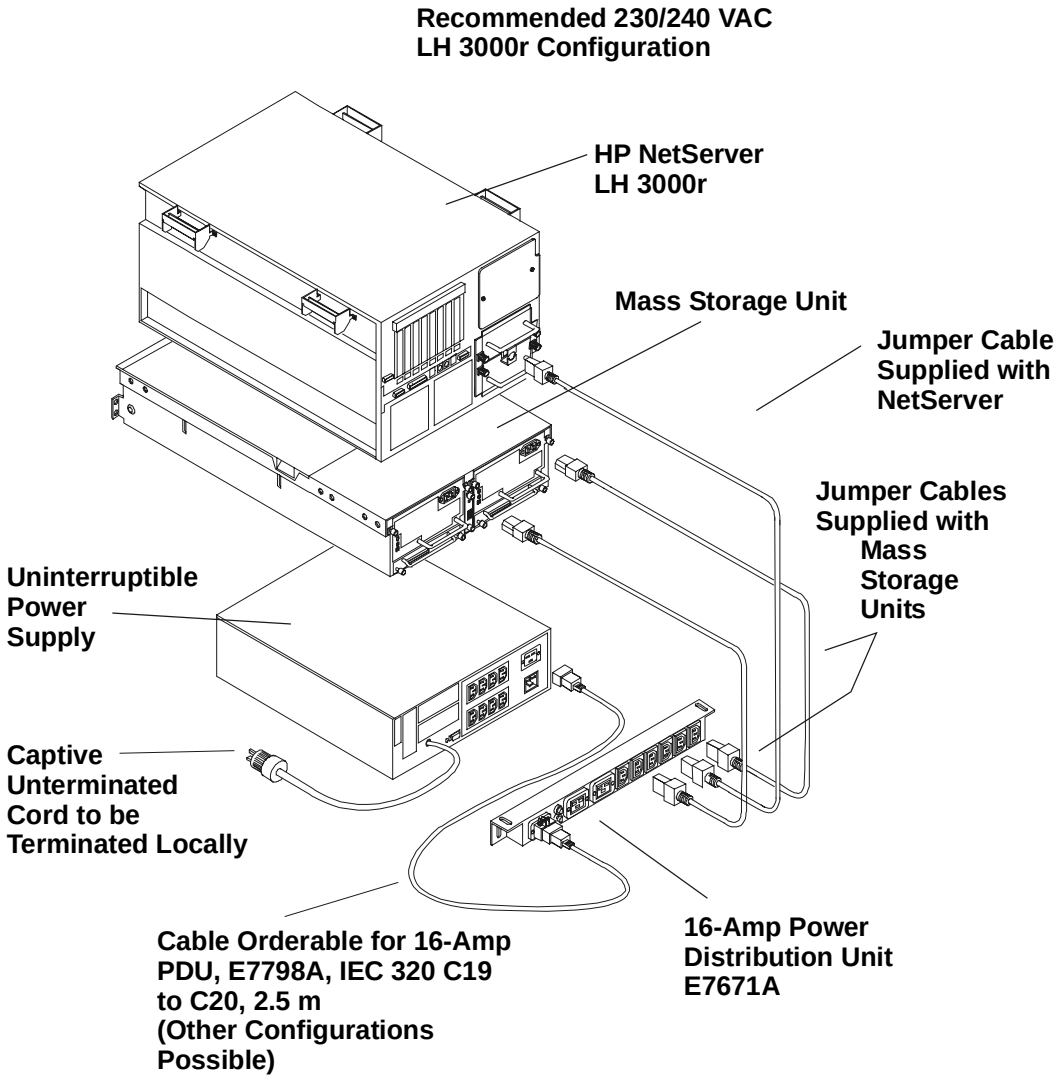

Figure 3-7. 230/240 VAC PDU Configuration

Redundant Power Configuration

Dual Power Supply Example

A dual power supply configuration can be created by ensuring that two different branch circuits feed two different Uninterruptible Power Supplies, which in turn power two PDUs. Figure 3-8 shows a dual power cabling example. This example shows two LH 3000r units powered by two PDUs and two UPS units. Plugging each UPS into a different branch circuit ensures dual power supply is maintained.

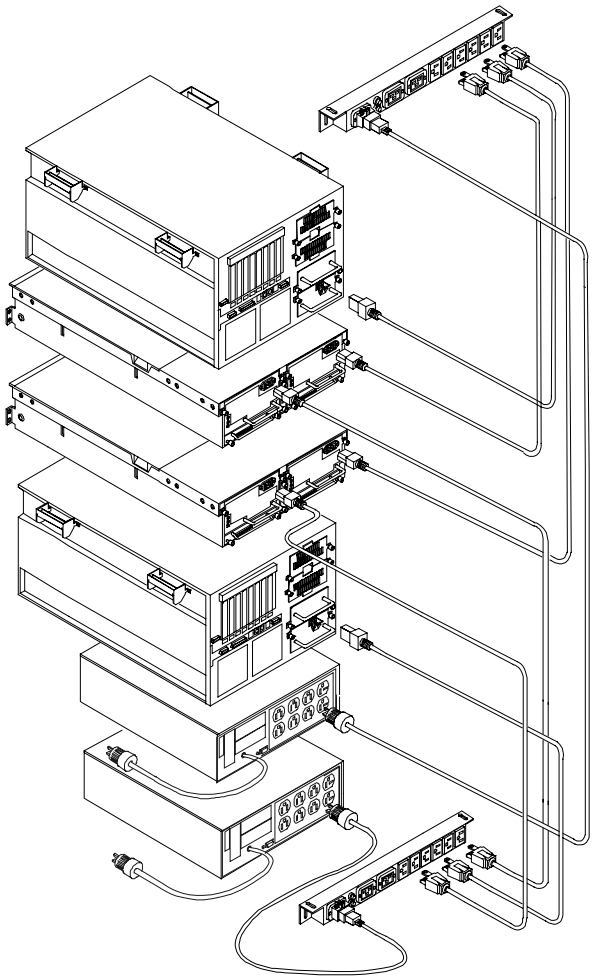

Figure 3-8. Dual Power Supply

High Density Configuration

High Density Configuration Example

A high density configuration is illustrated in Figure 3-9. For this example, one 41-EIA Unit Rack (a 2 meter HP Systems or HP System/E rack) is completely filled with power supplies, servers, and storage units. Two mass storage units "sandwich" each NetServer.

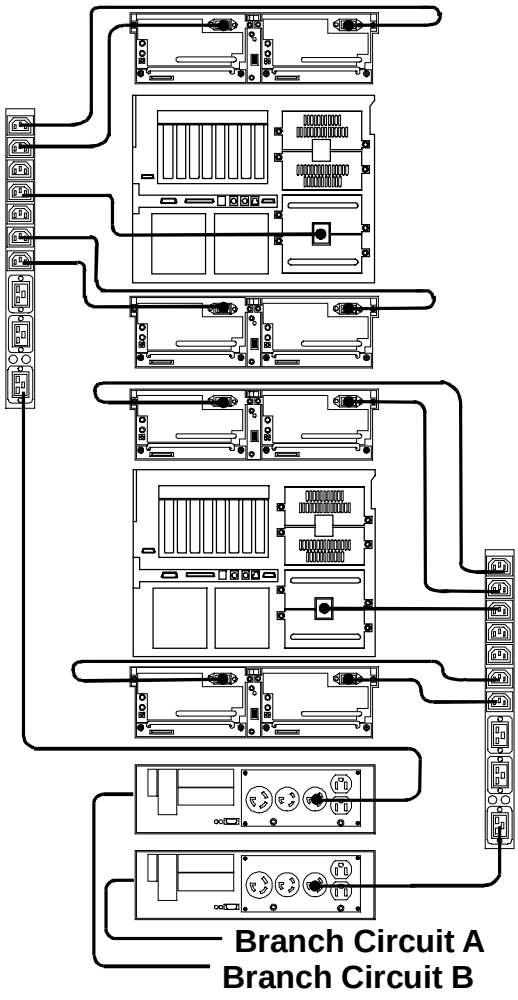

Figure 3-9. High Density Configuration, Block Diagram

Step 4: Managing and Routing Cables

Using the Cable Management Arm and the Cable Guides

The HP NetServer LH 3000r has one power input cable for each set of two installed power supplies. Another power cable is needed for the optional redundant power supply. Cables connect external devices and networks to the I/O adapters in the PCI slots. Because power and data cables are supplied only in one length, steps are necessary to manage the cables attached to the rear of the server.

A Cable Management Arm helps to ensure that the server can be extended for service and upgrade activities without tangling or disconnecting power and data cables.

Route and Tie Cables into the Management Arm

Instructions for mounting the cable management arm to the rear of the LH 3000r and to the HP Rack Systems unit are located in the rack mount chapter in the installation guide. The instructions below assume you have already mounted the arm.

1. Begin with the HP NetServer LH 3000r pushed all the way into the rack, and the Cable Management Arm retracted. Plug all data and power cables in and gather them to the corner formed by the back left side of the NetServer and the flange of the Arm. See Figure 3-10.

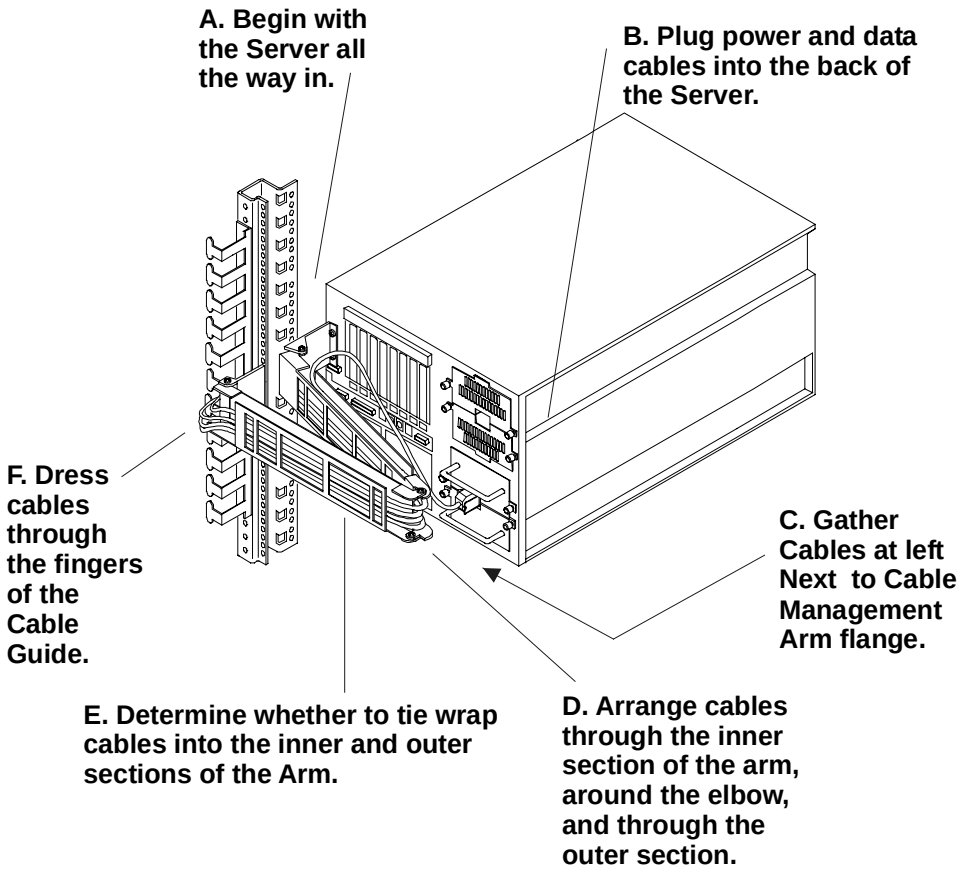
A. Begin with the Server all the way in.
B. Plug power and data cables into the back of the Server.
F. Dress cables through the fingers of the Cable Guide.
C. Gather Cables at left Next to Cable Management Arm flange.
E. Determine whether to tie wrap cables into the inner and outer sections of the Arm.
D. Arrange cables through the inner section of the arm, around the elbow, and through the outer section.

Figure 3-10. Routing Cables through the Arm

2. Arrange cables through the slot on the inner section of the Arm. If needed, secure cables in the cable arm using the hook-and-loop cables supplied with the NetServer.

WARNING	Before sliding the HP NetServer LH 3000r out of the rack, make sure you extend the anti-tip foot from under the front of the rack. A tip-over hazard exists, so never slide more than one component out of the rack at a time.

NOTE	Do not remove the screws that hold the slides to the front columns of the rack. Slide the NetServer out by grasping the handle below the LCD control panel.

3. Remove the front bezel and extend the anti-tip foot. Fully extend the NetServer (until it clicks) to determine how long the cable loop needs to be. See Figure 3-11.Cycle the server in and out of the rack to see whether hook-and-loop straps are required to secure the cables in the cable arm. If so, place them at regular intervals along the arm.

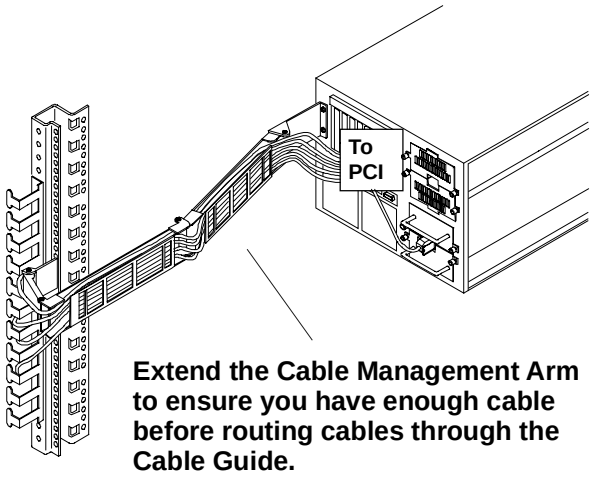

Figure 3-11. Extend the Server to Adjust Cable Lengths

4. Loop extra lengths of cable and tie-wrap it alongside the NetServer. Use Cable Guides on the column of the rack to route cables to their destinations.
5. If you use hook-and-loop straps, tighten each of them to ensure they support the cables correctly. Slide the NetServer in carefully making sure cables do not bind, adjust cables and straps as necessary. Repeat until the Cable Management Arm extends and retracts smoothly.
6. Secure the server to the front of the rack with screws and rack nuts and replace the bezel. See the *HP NetServer LH 3000/3000r Installation Guide* for details.

Step 5: Powering Up and Powering Down the Components in the Rack

Follow the Power Up Sequence to minimize inrush currents and prevent breakers from tripping.

Power Up Sequence

1. Power on peripherals one at a time, beginning with the tape back-up unit, continuing with the mass storage units, monitor, and the rest.
2. If an HP Console Switch is present, it must be on before the server is powered on. Otherwise the server will not detect all the required components and will likely report an error.
3. Lastly, power on one server at a time, waiting for fan units in one to spin up before powering on the next (if more than one is present in the rack).

Power Down Considerations

To power off the equipment, ensure that network users are properly warned. No specific order is necessary when powering off rack-optimized servers and associated components. However, to do so in an orderly way, you should bring down the operating system, then power off peripherals, then turn off servers.

WARNING	The HP NetServer LH 3000r is connected to standby power even when power is turned off. Do not open the system for maintenance except if you have removed the power cord.

A Cabling Checklist

Checklist for the Rack Cabling Process

	Use the Site Preparation Checklist in Chapter 1 to make sure your site is ready.
	Read and follow all Rack Assembly and Cabling Warnings in Chapter 1 and in the Assembly Instructions that accompany your HP Rack.
	Assemble (new) or assess (existing) rack equipment.
	Check Wattage, Volt Amps, and Amperage to ensure you do not overload your branch circuit breakers or the rack power supply and distribution equipment. Use tables in Chapter 2 and illustrations in Chapter 3 for this purpose.
	Mount the rack power subsystem, HP NetServer, HP Mass Storage Units, and peripheral equipment in the rack.
	Use instructions which come with them to mount the Power Distribution Unit(s) and the Cable Guides, and follow instructions in the *HP NetServer LH 3000/3000r Installation Guide* to mount Cable Management Arms.
	Attach data cables to the HP NetServer, leave slack for use in cable management, and connect cables to corresponding components.
	Attach power cables to the HP NetServer and other components in the rack, taking care to balance loads as necessary across PDUs and UPS units. Leave slack enough for use in cable management. See the section "Determining and Balancing Current Draw" in Chapter 3.
	Route cables through the Cable Management Arm(s) and the Cable Guides, and tie wrap them in place, if necessary.
	Power up components and then the server, following instructions in Chapter 3.

B Considerations in Mounting the Redundant Switch

A redundant switch is available from American Power Conversion Corporation (APC) for use in rack installations. Redundant switches can be used to enhance the reliability of rack power systems. This switch can be used with or without a rack-installed Uninterruptible Power Supply (UPS).

Table B-1 shows the Redundant Switch in six possible configurations.

Table B -1. Components for Use with the Redundant Switch and the LH 3000r

Item	North America: 100/120 VAC Mains		North America: 208/240 VAC Mains		International[1]: 230/240V Mains	
	Application with UPS	Application with No UPS	Application with UPS	Application with No UPS	Application with UPS	Application with No UPS
APC Redundant Switch Model No.	SU 042-2	SU 042-1	SU 045-1	SU 045-1	SU 044-1	SU 044-1
Power Cord from Power Mains to Switch	2 Captive Power Cords with NEMA L5-30P	2 Captive Power Cords with NEMA L5-30P	2 Captive Power Cords with L6-20P Plugs	2 Captive Power Cords with L6-20P Plugs	2 Detachable Power Cords, Country Specific	2 Detachable Power Cords, Country Specific
APC UPS Model No.	NS2200-RM3u	Not Used	NS3000-RMT3U	Not Used	NS3000-RMI3U or NS2200-RMI3U[2]	Not Used
Power or Jumper Cord from Switch to UPS	1 Captive Power Cord with L5-30R Receptacle	Not Used	1 Captive Power Cord with L6-20P Plug	Not Used	E7804A, 4m, C20 to C19	Not Used
Power or Jumper Cord from Switch to PDU	Not Used	2 each, E7802A, 4m, 5-20P to C19	Not Used	E7803A, 4.5 m, L6-20P to C19	Not Used	E7804A, 4m, C20 to C19
Circuit Limitation	3000 VA	3000 VA	3000 VA	3000 VA	3000 VA	3000 VA

Note 1. In North America, if 240 VAC is used, refer to these columns.

Note 2. This UPS limits circuit to 9.5 Amperes at 2200 VA.

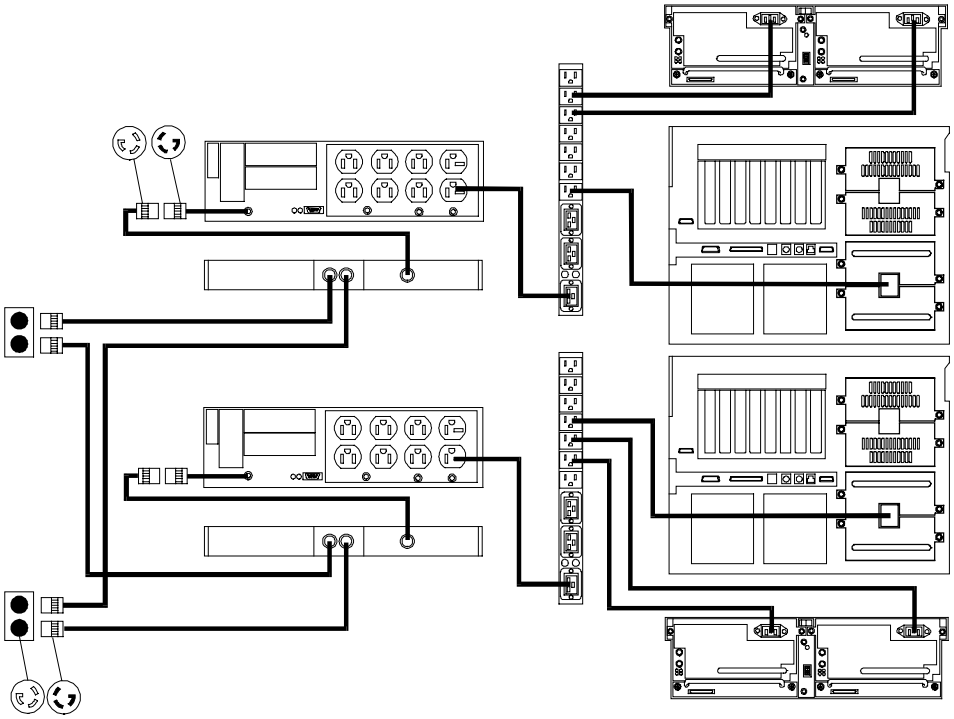

Figure B-1. 120 VAC Configuration of Redundant Switch between UPS and Branch Circuit

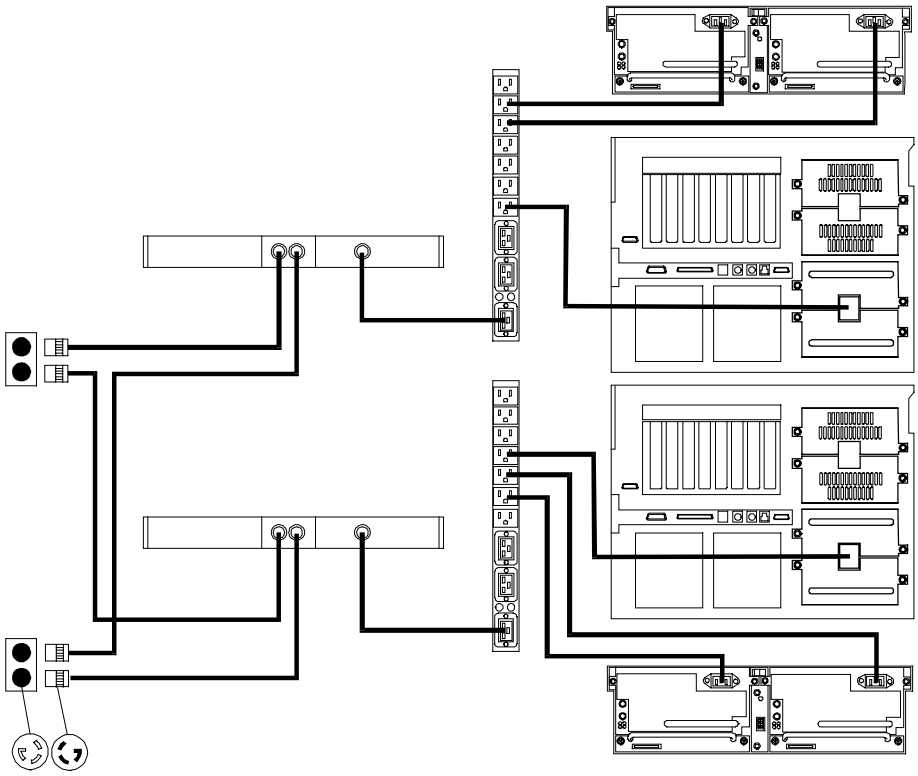

Figure B-2. 120 VAC Configuration of Redundant Switch between PDU and Branch Circuit

Note that switches of 200/208 and 230/240 VAC can be mounted in the same way as the 120 VAC models shown. See Table B-1.

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